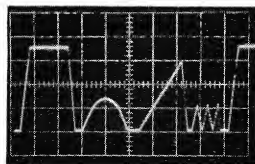
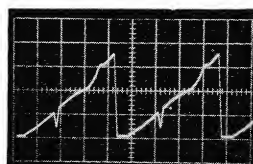


COMPLEX WAVEFORM GENERATOR "F"

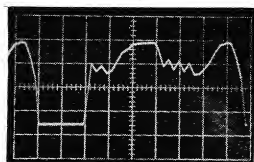
GENERAL RESEARCH
ANALOG COMPUTER
SERVO ANALYSIS/TEST



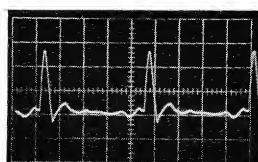
COMPENSATION
FOR DISTORTION
OR SYSTEM
NON-LINEARITY



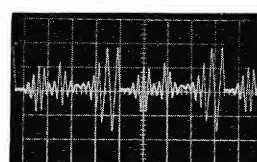
WAVEFORM ANALYSIS
DISTORTION STUDIES



CARDIAC
STIMULATION
EEG



SPEECH
SOUND
SONAR
TRANSIENTS
VIBRATION



BASIC TYPE 200 SYNTHESIZER

(WITHOUT PLUG-IN)

Increments/Row 10

Rows 1, 2, 3, 4 or 5

Neon Indicated

Power 375 watts

Accessories Included:

Instruction Manual

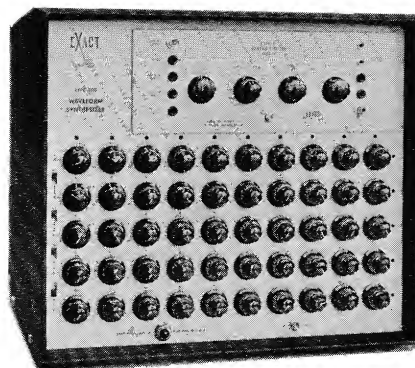
42" 93Ω output cable

42" trigger lead

BNC to UHF adapter

3-wire power cord

3-wire plug adapter



TYPE F SPECIFICATIONS

	SLOPES ONLY	MIXED	PRI. & SEC. MATRIX
Risetime-Falltime/incr.	1 incr. width	0.5μsec.	0.3μsec.
Width/increment	Variable from 3.3μsec. to 1 second		
Amplitude/increment		0 to 50V (var.)	0 to 10V (var.)
Amplitude/complete wave	15 to 50V (var.)	15 to 50V (var.)	10 volts
Slope Range	+ and - 25 volts	+ and - 25 volts	
DC voltage reference	0 to +25V (var.)	0 to +25V (var.)	+7 volts
Amplitude stability	Within 0.5% of max. output voltage.		
Time/increment accuracy	Within 0.1% between any two increments. Within 5% between any switched ranges.		
Output impedance	Cathode follower—nominally 2000 ohms.		
Output power	0.5 watts	0.5 watts	20 m watts
Waveform repeatability	Within 1% (1-2 hours) Within 3% (8-24 hours) reset reference level.		
Sync Out	15V gate at start of each program.		
Scale of Ten	35V gate at start of each row of 10.		



EXACT ELECTRONICS, INC.
455 S. 2nd Ave. - P.O. Box 160 - HILLSBORO, OREGON
Phone: Midway 8-3590 Area Code: 503

T
Y
P
E

F

V
A
R
I
A
B
L
E

S
L
O
P
E

P
L
U
G
I
N

TRIGGERING

Internal	Running at Time/incr. rate.
External	10V—1 μ sec. risetime trigger
	produces single increment.
Manual	Each trigger produces one
	increment.

10 Count Lockout.....	Manual or external trigger produces one row of 10 increments.
Program Lockout	Manual or external trigger produces one program of 20 to 50 increments.

When the Type "F" Variable Slope plug-in is used with the basic Type 200 Synthesizer the output is a sequence of slopes or slopes and amplitudes giving you an almost unlimited variety of waveform configurations. You can vary three parameters: (1) The individual amplitude of each increment. (2) The individual slope of each increment. (3) The duration of all the segments as a group. The output can be switched to contain 10, 20, 30, 40 or 50 increments. By adjusting the output reference level and the OUTPUT AMPLITUDE the individual increments and

slopes can have a range anywhere between -25 volts and $+50$ volts.

Auxiliary outputs are available from the Primary and Secondary potentiometer matrices, providing two groups of individually adjustable voltage levels. These groups are independent in output but triggered from the same source as the main output.

Each increment can be manually triggered or triggered at an external rate. You may also trigger individual rows of 10 sequentially or a whole program of 20 through 50 increments manually or at an external rate.

Attenuates SLOPES only and MIXED output from 15 to 50 volts.

Determines the individual widths of all the increments.

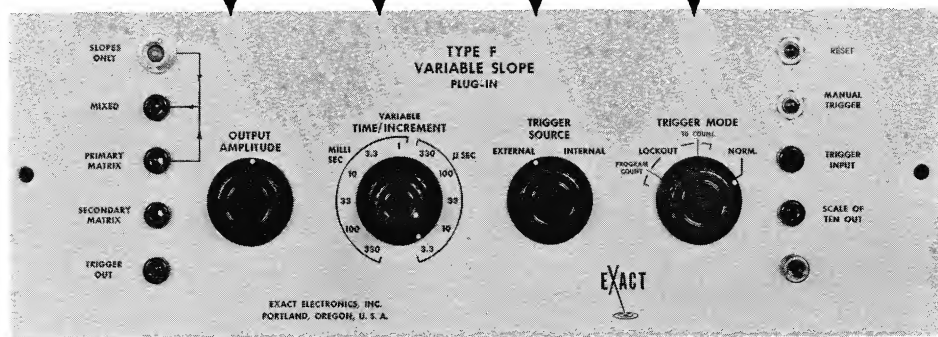
Selects internal trigger generator or permits external triggering of single increments.

Determines whether repetition rate is continuous or externally programmed.

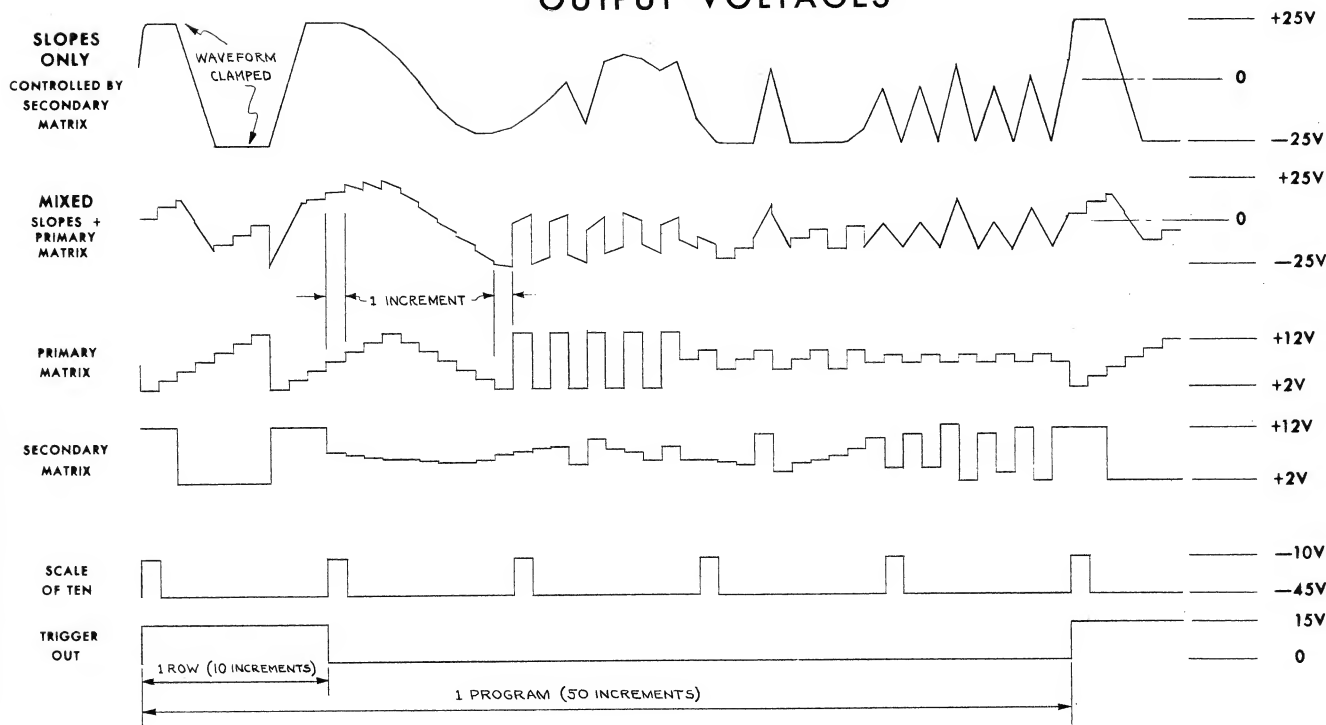
Manually triggers entire program or sequential rows of ten, depending on TRIGGER MODE setting.

Manually triggers one increment at a time when TRIGGER SOURCE is in EXTERNAL.

Requires 10v input at 1 μ sec. risetime to trigger one increment, sequential row of ten or an entire program, depending on TRIGGER MODE and SOURCE.



OUTPUT VOLTAGES



EXACT

EXACT ELECTRONICS INC



Electronic Simulation of Water Resources

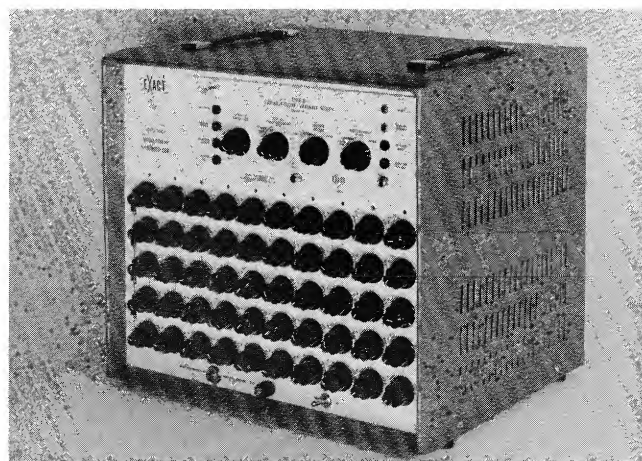
EXACT Type 200 Waveform Synthesizers are being used by the Water Resources Division of the U. S. Geological Survey in a program designed to apply computer techniques to water resource survey and development.

The program, centered in the WRD's Phoenix Research Office, begins with the collection of digital data on the behavior of ground and surface water levels over an extended period. This data, collected by sensing elements installed throughout the monitored area, is used to construct both a mechanical and an electronic model of the ground and surface water tables of that area.

The mechanical model, called a "hydrologic laboratory model", responds to microcosmic changes in its structure in the same manner as the actual monitored area responds to natural or man-made macrocosmic influences. The main purpose of the hydrologic model is to serve as a tool in the development of the electronic model.

The electronic model, capable of yielding sophisticated information about the response of water tables to rainfall and human depletion, is also constructed according to the monitored data. Then a precisely controlled change is introduced to the hydrologic model. The hydrologic system response if carefully observed, and the resultant changes in the water tables are recorded.

An EXACT Waveform Synthesizer is used to introduce an identical change into the electronic model, and comparison with the hydrologic response generates data for further refinement of the electronic system. The EXACT instrument was selected because of its unique system of generating complex waveforms as adjustable sequential increments. With the Type 200, a representative complex waveform can first be constructed, then the entire waveform can be attenuated without disturbing its shape, or individual increments can be modified without necessarily altering the balance of the waveform.



EXACT TYPE 200
WAVEFORM SYNTHESIZER

The end result of this research program will be accurate electronic simulation of a ground- or surface-water system which will simplify the study of the many complex parameters of water resource development. In essence, the researcher will be able to rapidly display a complex function representing the results of hundreds of years of rainfall, runoff, human depletion and other natural phenomena.

A more detailed discussion of the research program is presented in Hydrologic Models of Ground Water Movements, by H. E. Skibitzke, Research Mathematician, Water Resources Division, U.S. Geologic Survey. This article was originally published in "The Arizona Watershed Program in Review, Proceedings of the Sixth Annual Watershed Symposium", in September, 1962.

OTHER APPLICATIONS

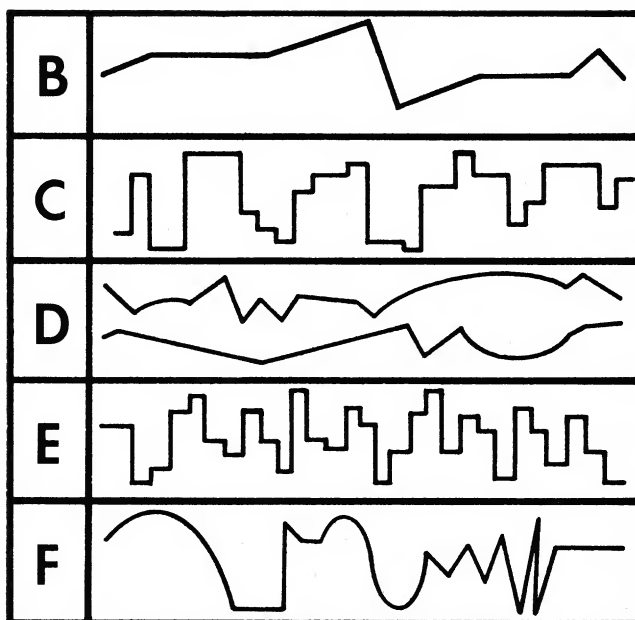
The TYPE 200 WAVEFORM SYNTHESIZER generates complex waveforms as fifty sequential increments, with two parameters adjustable for each increment. Both digital (adjustable width and amplitude) and analog (adjustable slope, width and/or amplitude) waveforms can be generated, depending on the plug-in unit selected.

DIGITAL PLUG-IN UNITS available include the Type C (50-increment waveform, individually adjustable amplitude and width for each increment) and the Type E (100-increment waveform, increment width adjusted by the plug-in unit's timing control, individually adjustable amplitude for each increment). For detailed information on digital waveform synthesis, see Type 200/C, E brochure.

ANALOG PLUG-IN UNITS available include the Type B (individually adjustable slope and width for each increment), the Type D (dual-output, individually adjustable slope), and the Type F (individually adjustable slope and amplitude for each increment). For detailed information on analog waveform synthesis, see Type 200/B, D, F brochure.

SHOCK TESTING. The Waveform Synthesizer is extremely valuable as a source generator for driving shaker tables to produce shock tests. The output of the synthesizer can be carefully shaped to produce exactly the desired shock motion. The synthesizer can be adjusted to compensate for inherent ringing or bounce characteristics of the table platform with any typical specimen mass. One technique often used is to attach an accelerometer to the specimen and monitor the accelerometer output on an oscilloscope. Then the synthesizer is adjusted until the accelerometer displays the desired motion. Of course with the Type 200 Waveform Synthesizer, any output waveform can be repeated at any repetition rate (externally triggered) to provide as many shock tests as needed. Types B and F are the most commonly used plug-in units for shaker table applications.

MEDICAL ELECTRONICS. The medical electronics field is a natural for the waveform synthesizer. For example, the synthesizer may be easily set up to simulate nerve or cardiovascular pulses, or special electroencephalogram patterns. The synthesizer can also be used as a stimulating-pulse generator for research, therapy and operating techniques. Some other very interesting applications come to mind when you realize that the synthesizer can produce simulating or stimulating pulses readily adjustable from abnormally "low", through normal, to abnormally "high" characteristics (either amplitude, repetition rate, or sharpness). An entire ward of patients can be individually simulated (with respect to cardiovascular pulses, for example) to thoroughly test a new medical-electronic device, providing an effective cross-section of typical



conditions or symptoms without expensive "live" data collection.

TELEMETRY. The waveform synthesizer is ideally suited for simulating various telemetric data signals. Up to 100-bit signals can be generated with either PCM or PAM modulation and either RZ or NRZ technique. Program amplitude and timing are adjustable, and each increment (bit) is individually adjustable. Standard checkout programs can be produced for on-line operation or various marginal signals can be generated for testing or evaluating telemetry equipment.

CIRCUIT DESIGN. The design of many special circuits can be simplified through utilization of the waveform synthesizer. Input timing and control signals can be produced by the synthesizer to test circuits under simulated operating conditions. Inputs can be varied to simulate environmental changes or to test circuit operation at marginal parameters. Delayed pulses can be generated with delays from 2 μ sec to over one minute. Compensating waveforms can be produced for linearizing reflex klystrons. These and many other circuit-design applications are samples of the synthesizers extraordinary flexibility for laboratory, checkout, or systems use.



PRINTED IN U.S.A.